# CHAPTER 6

# Role of nanofillers in elastomer–elastomer blends

**Jeefferie Abd Razak[1], Sahrim Haji Ahmad[2], Noraiham Mohamad[1], Hairul Effendy Ab Maulod[1], Ramli Junid[3], Soh Tiak Chuan[4] and Poppy Puspitasari[5]**

[1]Fakulti Teknologi dan Kejuruteraan Industri dan Pembuatan, Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya, Durian Tunggal, Melaka, Malaysia
[2]Materials Science Program, Department of Applied Physics, Faculty of Science and Technology, Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia
[3]Faculty of Manufacturing and Mechatronic Engineering Technology, Universiti Malaysia Pahang Al-Sultan Abdullah, Pekan, Pahang, Malaysia
[4]Rubber Leisure Products Sdn. Bhd., Kawasan Perindustrian Serkam, Merlimau, Jasin, Melaka, Malaysia
[5]Mechanical and Industrial Engineering Department, Center of Advanced Materials and Renewable Energy, Universitas Negeri Malang, Malang, East Java, Indonesia

## Abstract

Elastomer–elastomer hybrid blend nanocomposites are at the forefront of materials science, promising enhanced mechanical properties and versatile applications. This chapter provides a thorough exploration of recent advances, challenges, and prospects in this innovative field. We delve into the pivotal role of nanofillers, including graphene nanoplatelets, carbon nanotubes, and clay nanoparticles, in bolstering the mechanical performance of elastomer–elastomer blends. Challenges in achieving optimal dispersion and compatibilization of nanofillers within blend matrices are discussed along with opportunities for property enhancement. Additionally, we examine the complex interplay between nanofiller dispersion, morphological behavior, and thermal stability in these nanocomposites. Surface functionalization techniques are scrutinized for their efficacy in enhancing nanofiller–matrix interactions and improving thermal stability. Furthermore, we investigate how nanofiller dispersion influences barrier properties and functional characteristics, showcasing applications ranging from rocket-propellant inhibitors to stretchable piezoelectric nanogenerators. Despite significant progress, challenges such as the scalability of processing, cost-effectiveness of nanofillers, and concerns regarding nano-toxicity persist. Continued research efforts are essential to address these obstacles and fully unlock the potential of elastomer–elastomer blend nanocomposites across diverse engineering domains. In conclusion, this chapter offers a comprehensive overview of the current state-of-the-art, challenges, and future directions in elastomer–elastomer hybrid blend nanocomposites, serving as a valuable resource for researchers, engineers, and practitioners seeking to harness the transformative capabilities of these advanced materials.

**Keywords:** Elastomer-elastomer blend nanocomposites; nanofillers; mechanical properties; hermal stability; surface functionalization

*Nanofillers for Binary Polymer Blends*
DOI: https://doi.org/10.1016/B978-0-323-88655-0.00006-9